

Advanced Docking Mechanism

Project Number: 95-11

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Purpose

To develop a mechanism to serve as the next generation spacecraft mating system.

Background

Docking technology began with the development of the Gemini and Apollo docking systems by the U.S., and the successful probe and drogue series of docking systems by the Russians. These early systems laid the groundwork for the development of the Apollo-Soyuz docking system from which all current manned spacecraft docking hardware is derived, the U.S. Space Station phase B docking/berthing system and the Russian APAS System. Both U.S. and Russian docking experts have recognized a new approach, termed capture-berthing, as a leading candidate for the next generation of spacecraft mating hardware. Traditionally, docking systems rely on the loads generated by contact of two spacecraft to enable the docking process. This leads to high loads in the spacecraft being mated. Capture-berthing, however, is a process by which one spacecraft “reaches out,” attaches to, and mates with another spacecraft—after the two are stationkeeping within close proximity of each other. This process leads to a reduction in the loads which are generated in both spacecrafts. This next generation of hardware is needed based on the problems which are attributed to the current systems, mainly the high impact loads which are generated and the fact that the current systems are not androgynous.

Approach

The proposed CDDF activity seeks to take one of the current docking system designs, the Space

Station phase B docking/berthing system, and modify it to develop a capture-berthing system and then test the new system and evaluate its performance. The present design of the Space Station phase B docking/berthing system lends itself well to the application of capture-berthing and androgynous operations. The system was developed in a joint program between MSFC and McDonnell Douglas Aerospace during the Phase B phase of the Space Station Freedom program, and the hardware currently reside within the Propulsion Laboratory.

Accomplishments

The majority of the work which has been conducted during the past year has been to complete the setup and checkout of the test facility, figure 45, and to complete the proof of concept testing. To date, the facility setup and checkout has been completed and initial testing has been performed. The plan is to complete the testing and provide a final report by November 1, 1997.

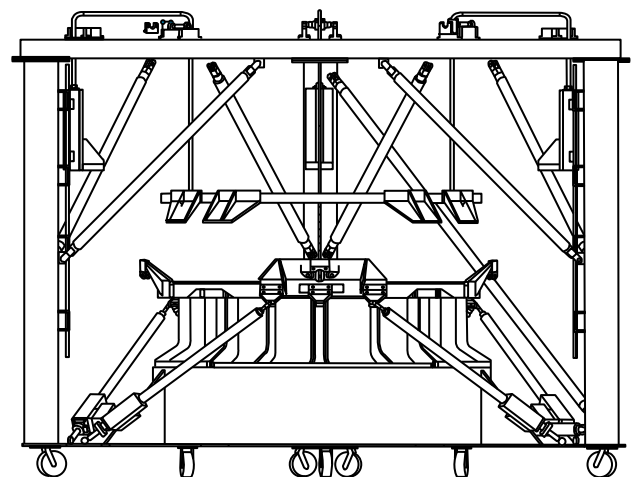


FIGURE 45.—The capture berthing demonstration unit.

Planned Future Work

The current plan for this CDDF project is to complete to the proof of concept tests by November 1, 1997, as proposed.

Funding Summary (\$k)

Currently, all funds have been obligated.

Status of Investigation

Project approval—October 1, 1994

Estimated completion—November 1, 1997